Court, in the house recently pulled down and replaced by so many houses and streets that its site is now lost, receives the most scanty attention. Here, too, illustration fails us, which is much to be pitied, because illustration in the former part of the book has afforded its chief value.

There is nothing more painful to a reviewer than to find himself forced to discover faults and deficiencies in a work under his observation, and we have felt severely the task of pointing out the defects and deficiencies of the volume before us. But it would be false, even to the author of the work, if we did not notice its failures, for there is evidently an ardent desire on his part to be not only a faithful, but an enthusiastic biographer. What is wanted in his essay is work! work! work! expurgation of all that is irrelevant, introduction of all that can be added beyond what has been told by predecessors on the subject, with avoidance of the pitfalls of mere memory.

In a new edition, if it should appear, we will hope that the improvements suggested, in a perfectly friendly spirit, will be carried out. The volume as it now stands is a groundwork of a good treatise, which, under the influence of industry, learning, spontaneity, and art, might yet secure a good place in the literature of the century.

GOLD.

The Metallurgy of Gold. By T. Kirke Rose, B.Sc. (London: Charles Griffin and Co., 1894.)

A Hand-book of Gold Milling. By Henry Louis. (London and New York: Macmillan and Co., 1894.)

THESE two books, which have been issued almost simultaneously, constitute important additions to the metallurgy of gold. They are both written by Associates of the Royal School of Mines, and it is singular that although the students of this great national institution have taken their full share in conducting mining and metallurgical operations in all parts of the world, and have gained wide experience, no treatise claiming to give a general account of the metallurgy of gold could hitherto have been attributed to a student of the School of Mines. No work on this subject of equal importance has appeared in English since Dr. Percy issued his volume on "Silver and Gold," in 1880, but his book, although unrivalled in accuracy of detail, is only a splendid fragment, and gold is alone dealt with in the sections devoted to the refining of bullion and to assaying.

Mr. Rose, who it appears gained his experience of gold and silver extraction in the Western States of America, is one of the able band of young men of whom Prof. Roberts-Austen is forming, in this country, a new school of metallurgists which is doing so much physical work in connection with metals and alloys. In the present volume Mr. Rose has made a successful effort to supply a succinct summary of the existing conditions of the metallurgy of gold for the use of students and others who are interested in the industries connected with the precious metals. In the second volume under review, Mr. Louis turns, it is true, more directly to an industrial application of the metallurgy of gold, and addresses the mill-man rather than the student; but Mr. Rose's volume is far from being only a student's manual, as he keeps steadily in view the needs of the managers of the gold mine and smelting works, a class who have hitherto considered that they had "little to learn from books."

The whole of the ground indicated by the title "metallurgy of gold" has been covered by Mr. Rose with equal care, and the space is carefully apportioned to the various branches of the subject according to their relative importance. Mr. Rose is probably at his best in dealing with the chemistry of the subject, as, for instance, in describing the MacArthur-Forrest process, which is now, for the first time, fully dealt with in a manual. Its importance may be gathered from the fact that nearly one-tenth of the world's annual production of gold is now being extracted by its aid. Among other processes which have not hitherto been described in a book, three deserve special mention. These are the process for separating gold from silver by the new Gutzkow process; the electrolytic process; and the modern barrel chlorination process, which is practised with great success in Dakota, where the Black Hills district is being rapidly developed by its aid. These processes are of special interest, but none which have stood the test of experience have been omitted. The four chapters devoted to chlorination, written from the point of view alike of the practical man and the chemist, teem with considerations hitherto unrecognised, and constitute an addition to the literature of metallurgy, which will prove to be of classical value.

The author has evidently taken great pains to secure details of gold-working from all parts of the world, and his descriptions range from Colorado to New Zealand and thence to South Africa, and as a result he has furnished practical men with details of working which should be of much service to them.

No less than eleven pages are devoted to an elaborate bibliography that is certainly more complete than any earlier ones, the latest of which—in Lock's work on the occurrence of gold—only brought us to the year 1882.

The illustrations are simple but effective; they are sufficiently accurate, and are characterised by much freshness, there being no time-honoured diagrams from other metallurgical manuals. The same may be said of the illustrations in Mr. Louis' work.

Mr. Louis, in his book on "Gold Milling," has mainly limited his attention to the treatment of gold ores in stamp mills, and has, as the result of much personal experience, written a treatise of great practical value. He gives details of machinery with great fidelity, as a worthy pupil of the late Dr. Percy would be sure to do. While Mr. Louis clearly sets forth the general methods of working adopted in stamp mills, he reserves for full description those which he considers to be the best, instead of giving details of all methods, good, bad, and indifferent, that are to be met with in various parts of the world.

In a future edition the author would do well to devote additional space to considerations relating to the mill site, its building, modes of construction, and installation of machinery. These are of more importance to the mill manager, for whom the work is intended, than the shape of the cam-curve, and other points to which the maker of machinery should attend. The experience gained in the South African gold-fields, where the number of stamps at work is greater than in any other country, has

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led to great developments of practice, which it would be well to consider when the time comes for revising the work. If, however, the book be considered as a whole, Mr. Louis has undoubtedly offered the best account of gold milling that has yet appeared.

In concluding this review of both books, it may be well to remind the reader that, of all the phases of metallurgic art, that which leads to the consideration of gold is the most interesting. It is certain that modern chemistry had its dawn in the study of the properties of gold, while from the fourth to the fifteenth century chemists thought of little else than transmuting base metals into precious ones. The protest of the metallurgist against such wasted labour was, however, felt as early as the middle of the sixteenth century, and a book, "Rechter Gebrauch d'Alchemei," was published (1531), which by its title showed that the "right use of alchemy" was to bring chemical knowledge to bear upon industry. Hence it is that the modern metallurgist makes strenuous efforts not to transmute base metals into gold, but to extract it economically from a mass of material of which fifteen million parts may only contain one part of gold. It would be most interesting to know at what cost this is done, but upon this point Mr. Rose is unable to give us very definite information, though it is evident he considers that the ounce of fine gold which sells for about £4, should be produced for about £3, if it is to yield a profit to the miner and metallurgist.

Both books under review have each their special value. Mr. Rose has adopted a broad treatment of a very interesting subject, while Mr. Louis has shown how important a single branch of the metallurgy of gold can be.

OUR BOOK SHELF.

Geology. By Charles Bird, B.A., F.G.S. Pp. viii., 430. (London: Longmans, Green, and Co., 1894.)

LIKE the previous volumes in the series of Advanced Science Manuals published by Messrs. Longmans, this satisfies the requirements of the advanced stage of the Department of Science and Art. A sub-title informs us that the book is "a manual for students in advanced classes and for general readers." But while we believe the work to be well suited for use among students learning geology on South Kensington lines, we should be sorry to recommend it to the general reader, that is to say, to the person who reads geology for the pleasure it affords, and not with the idea of eventually exercising the acquired knowledge in an examination room. The author has collected together an abundance of facts, but the student who has to digest them all deserves our sympathy. There are, however, several good points about the book. One of these is the chapter on the industrial uses of rocks, in which numerous buildings, monuments, and other structures in London and elsewhere are noted as examples of various kinds of building materials. References to the practical application of geology to water supply, agriculture, and mining are also frequently made, and will doubtless endear the book to the man who measures the value of a science by its direct use in commercial life.

Mr. Bird has taken advantage of the splendid collection of photographs of geological formations published by Messrs. Wilson, of Aberdeen. The illustrations obtained from this source are among the best in the book, and many of them have not previously appeared in any work on geology or physiography. Another excellent feature in the pictorial part of the book is that a number of the figures of fossils, rocks, and minerals are from photographs of objects in the Jermyn Street Museum. The illustrations of some of the minerals are, however, not very instructive. The only use of a figure is to assist the student to distinguish the characteristics described in the text. It is doubtful, however, whether the figures of hornblende, heavy spar, fluor spar, iron pyrites, galena, and sulphur, given on pp. 24-30, are any help to identification, though one or two of them may serve to illustrate crystalline habit.

Scarcely any attention is paid to the microscopical examination of rocks, and we have vainly consulted the index for references to the use of the seismograph, earth-tremors, the permanence of ocean basins, secular movements of the sea, and several other subjects of recent work. Even if these matters are not specially mentioned in the syllabus which the book has been designed to meet, they might have been included with advantage. We note that Eozoon is still referred to as "the most ancient fossil known," though its mineral formation has been clearly made out. But taken altogether the book is trustworthy, and the student who assimilates its contents need not fear to present himself for the examination in Advanced Geology held by the Department of Science and Art.

The New Technical Educator. Vol. III. (London, Paris, and Melbourne: Cassell and Company, 1894.)

THE previous volumes of this series have been duly noticed in these columns, where it was pointed out that they very adequately fulfilled a useful purpose. The present volume is up to the level of its predecessors, treating as it does of every-day general engineering and other matters in their broadest sense. The information given is certainly of very recent date, and this is as it should be, from every point of view. There are, however, a few statements made that are not quite accurate; for instance, on p. 102 we are told that among other things wrought iron is supplied commercially in the form of rails. What railways now-a-days use iron rails? They are things of the past, steel having years ago taken their place. Further on we read that steel plates may now be obtained up to 70 square feet in area. Surely double this area would be nearer the mark? On page 105 we are told that fullering a rivetted joint means to caulk it with a narrow edge tool (as at C, Fig. 3). This is certainly not the case; to fuller a joint means to "set up" the plate edge with a tool at least the thickness of the plate, whereas the method shown in the figure is generally known as "narrow edge caulking." Further on it is stated that looseness at the rivets is sometimes guarded against by caulking the rivet-heads. This is all very well, but loose rivets should be cut out and replaced by sound ones.

Under the heading of "various types of steam boilers" we find much useful information, the locomotive type being represented by the standard boiler used on the Lancashire and Yorkshire Railway; it is, however, stated that in some cases the water spaces are carried down and across the bottom, thus constituting an ash-pan and called a wet bottom. This no doubt is true of a few boilers built at Crewe, but in the majority of cases the wet bottom is unknown to modern railway practice. In this chapter George Stephenson is said to have introduced the blast pipe in locomotives. Surely this invention is due to Richard Trevithick?

The marine type of boiler is represented by one made by the Central Marine Engine Company, West Hartlepool; it is of the single-ended type, and fitted with Fox's corrugated flues. Of water tube boilers there are two standard examples, viz. the Babcock and Wilcox for stationary engines, and the Thorneycroft for marine and

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